6th Grade Mathematics

Geometry

Unit 4 Pacing Calendar: May 2nd – June 22nd

ORANGE PUBLIC SCHOOLS

OFFICE OF CURRICULUM AND INSTRUCTION

OFFICE OF MATHEMATICS

From the Common Core State Standards:

In **Grade 6**, instructional time should focus on four critical areas: (1) connecting ratio and rate to whole number multiplication and division and using concepts of ratio and rate to solve problems; (2) completing understanding of division of fractions and extending the notion of number to the system of rational numbers, which includes negative numbers; (3) writing, interpreting, and using expressions and equations; and (4) developing understanding of statistical thinking.

1. Students use reasoning about multiplication and division to solve ratio and rate problems about quantities. By viewing equivalent ratios and rates as deriving from, and extending, pairs of rows (or columns) in the multiplication table, and by analyzing simple drawings that indicate the relative size of quantities, students connect their understanding of multiplication and division with ratios and rates.

2. Students use the meaning of fractions, the meanings of multiplication and division, and the relationship between multiplication and division to understand and explain why the procedures for dividing fractions make sense. Students use these operations to solve problems. Students extend their previous understandings of number and the ordering of numbers to the full system of rational numbers, which includes negative rational numbers, and in particular negative integers. They reason about the order and absolute value of rational numbers and about the location of points in all four quadrants of the coordinate plane.

3. Students understand the use of variables in mathematical expressions. They write expressions and equations that correspond to given situations, evaluate expressions, and use expressions and formulas to solve problems. Students understand that expressions in different forms can be equivalent, and they use the properties of operations to rewrite expressions in equivalent forms. Students know that the solutions of an equation are the values of the variables that make the equation true. Students use properties of operations and the idea of maintaining the equality of both sides of an equation to solve simple one-step equations. Students construct and analyze tables, such as tables of quantities that are in equivalent ratios, and they use equations (such as $3x = y$) to describe relationships between quantities.

4. Building on and reinforcing their understanding of number, students begin to develop their ability to think statistically. Students recognize that a data distribution may not have a definite center and that different ways to measure center yield different values. The median measures center in the sense that it is roughly the middle value. The mean measures center in the sense that it is the value that each data point would take on if the total of the data values were redistributed equally, and also in the sense that it is a balance point. Students recognize that a measure of variability (interquartile range or mean absolute deviation) can also be useful for summarizing data because two very different sets of data can have the same mean and median yet be distinguished by their variability.

May 2016

Unit 4: Geometry

Chapter 9 - The Coordinate Plane: In this chapter students identify and plot points on the coordinate plane and identify their quadrants. Students will identify the coordinate of points reflected about each axis, plot points and connect points to form polygons. Given the coordinates of two or more vertices, they use properties of polygons to locate unknown vertices. Students use absolute values to calculate lengths of segments on the coordinate plane. Students are also introduced to linear graphs as a tool for visualizing the relationship between two variables.

Chapter 10 - Area of Polygons: In this chapter students derive formulas for areas of triangles, parallelograms, trapezoids and regular polygons. They use the formulas to find areas and given an area, identify unknown dimensions. They explore the geometric meaning of base, they derive the formula for A =Bh for parallelogram, and also draw triangles to derive the formula for trapezoid.

Chapter 12 - Surface Area and Volumes of Solids: In this chapter students will extend their knowledge of plane figures to solids. They relate solids to their nets and use nets to find surface area. The hands on activities will help students to relate concrete and pictorial models. Students will fold nets into solids, break solids into nets and draw both solids and nets. Students will also use formulas and algebraic thinking to solve surface area problems, volume problems, and real-world problems involving the surface area and volume of prisms and pyramids

MAY

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1	2 Unit 4: Geometry *Chapter 9 Pre-test (MIF)*	3 Unit 4: Chapter 9 Transition Lesson	4	5	6	7
8	9	10	11 *Assessment: Chapter 9 Test (MIF)*	12 Unit 4: Geometry *Chapter 10 Pre-test (MIF)*	13 Unit 4: Chapter 10 Transition Lesson	14
15	16	17	18	19	20	21
22	23	24	25	26	27 Unit 4: *Performance Task 1 due*	28
29	30 Memorial Day District Closed	31 Snow Day Make up District Closed				

June 2016

Unit 4: Geometry

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JUNE

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
			1 ***Assessment: Chapter 10 Test (MIF)***	2 ***Assessment: Unit 4 Assessment 1***	3 **Unit 4: Geometry** ***Chapter 12 Pre-test (MIF)***	4
5	6 **Snow Day Make up** **District Closed**	7 **Unit 4: Chapter 12 Transition Lesson**	8	9	10 **Unit 4:** ***Performance Task 2 due***	11
12	13	14	15	16	17	18
19	20 ***Assessment: Chapter 12 Test (MIF)***	21 **Unit 4:** ***Performance Task 3 due***	22 ***Assessment: Unit 4 Assessment 2***	23 **Last day for students**	24	25
26	27	28	29	30		

Babysitting (6.EE.C.9)

Teresa baby-sits for $4.50 an hour.

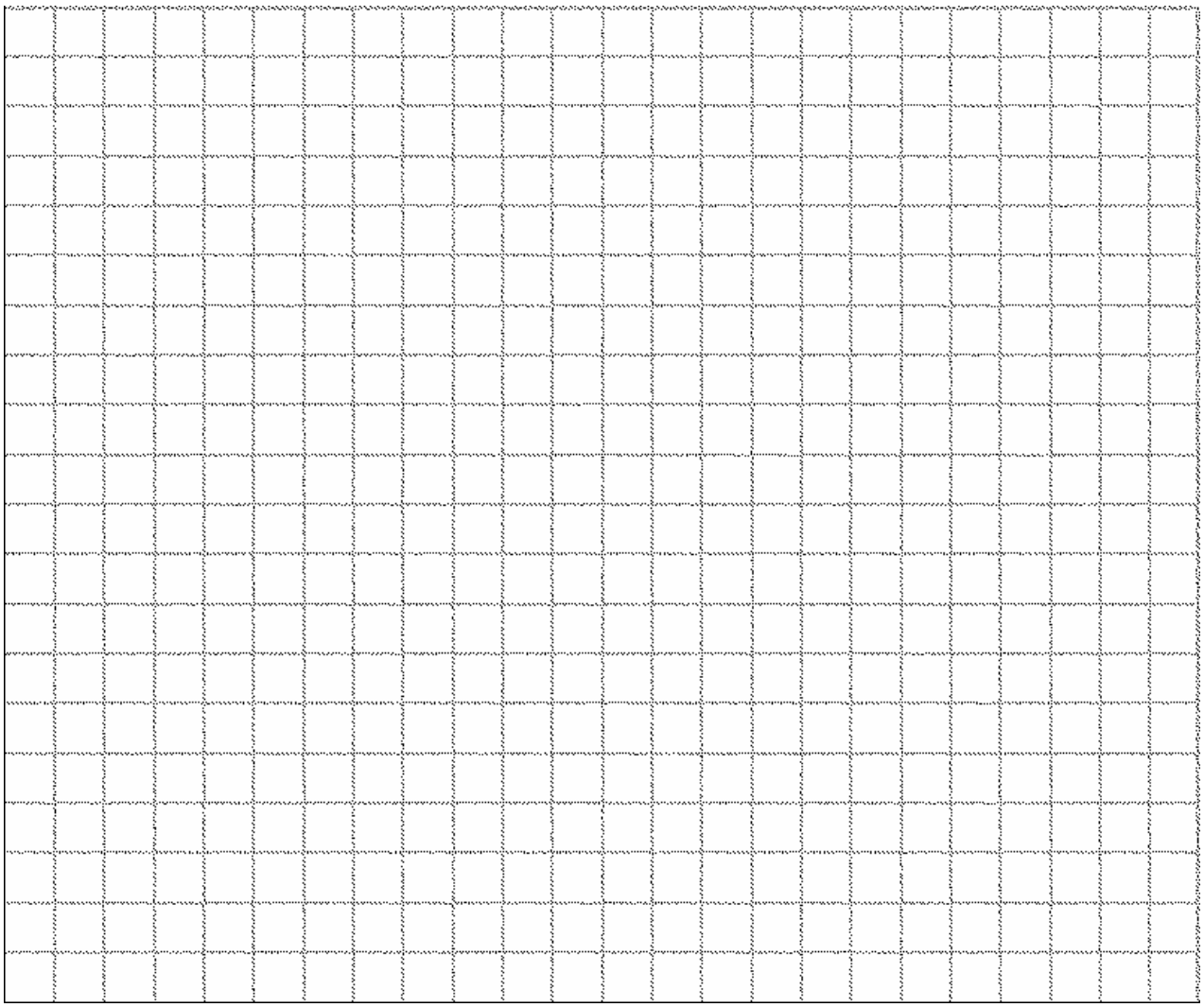
a. Make a table showing how much money she will make over time.

b. Graph your data, label the axes and name the graph. (See graph on page 2)

c. Does it make sense to connect the points on the graph? Why or why not?

d. About how many hours does Teresa have to baby-sit to earn $20? Explain your answer.

e. If Teresa baby-sits 5.5 hours, how much will she earn? Explain your answer.

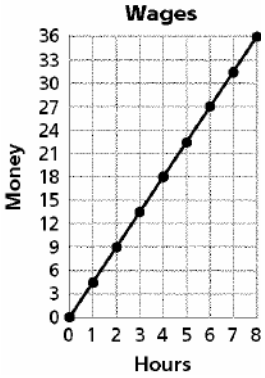


Solution

a.

Hours	Money
1	4.50
2	9.00
3	13.50
4	18
5	22.50
6	27
7	31.5
8	36

b.



c. Students may argue for or against connecting the dots. As they work longer hours than their money earned increases indicating a continuous change, but when people work part of an hour they are often paid for the full hour, in which case it would not be continuous.

d. 4.50h = 20

4.50h/4.50 = 20/4.50

h = 4.44

or

$20.00 is between $18.00 and $22.50. So Teresa has to work more than 4 hours but less than 5 hours

About 4.5 hours.

e. If Teresa works 5 hours she will make $22.50. If she works 1 hour she makes $4.50, but if she works for half an hour she makes $4.50/2 = $2.25. Therefor Teresa makes $22.50 + $2.25 = $24.75 for 5.5 hour.

Unit 4 Performance Task 1 PLD Rubric

SOLUTION

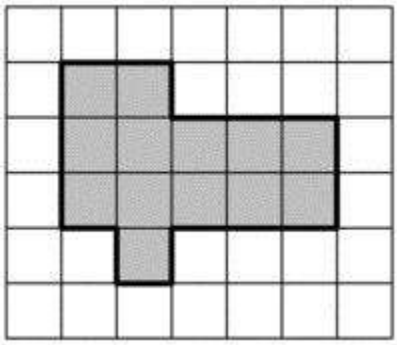
- Student creates the table and graph
- Student explains why the graph makes sense by saying that If Teresa works for longer hours she will make more money with a continuous change in the increase amount.
- Student indicates that in order to make $20.00, Teresa will need to work 5.5 hours and explain his/her work by referring to the table or an equation that represent the situation.
- Student indicates that Teresa will make $24.75 if she worked 5.5 hours and explains his/her work by referring to the table or an equation that represent the situation.

Level 5: Distinguished Command	**Level 4: Strong Command**	**Level 3: Moderate Command**	**Level 2: Partial Command**	**Level 1: No Command**
Clearly constructs and communicates a complete response based on concrete referents provided in the prompt or constructed by the student such as diagrams that are connected to a written (symbolic) method, number line diagrams or coordinate plane diagrams, including: • a logical approach based on a conjecture and/or stated assumptions • a logical and complete progression of steps • complete justification of a conclusion with minor computational error.	Clearly constructs and communicates a complete response based on concrete referents provided in the prompt or constructed by the student such as diagrams that are connected to a written (symbolic) method, number line diagrams or coordinate plane diagrams, including: • a logical approach based on a conjecture and/or stated assumptions • a logical and complete progression of steps • complete justification of a conclusionwith minor conceptual error	Constructs and communicates a complete response based on concrete referents provided in the prompt or constructed by the student such as diagrams that are connected to a written (symbolic) method, number line diagrams or coordinate plane diagrams, including: • a logical, but incomplete,progression of steps • minor calculation errors • partial justification of a conclusion	Constructs and communicates an incomplete response based on concrete referents provided in the prompt such as: diagrams, number line diagrams or coordinate plane diagrams, which may include: • a faulty approach based on a conjecture and/or stated assumptions • An illogical and Incomplete progression of steps • major calculation errors • partial justification of a conclusion	The student shows no work or justification.

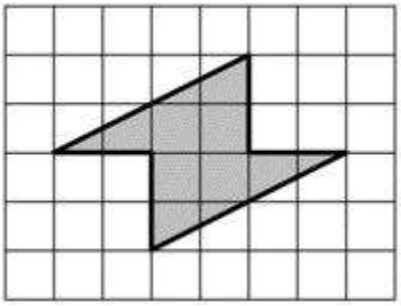
Finding Areas of Polygons (6.G.A.1)

Find the area that is shaded in each figure in at least two different ways

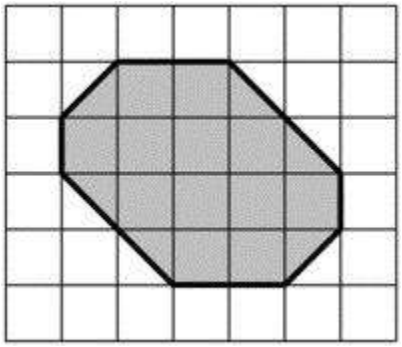
a.



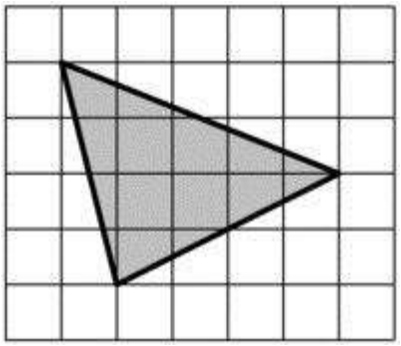
b.



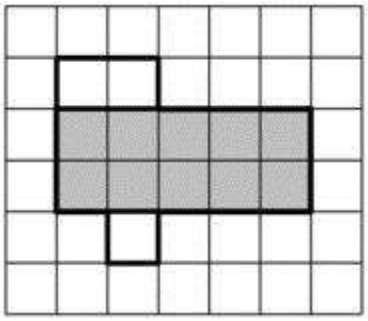
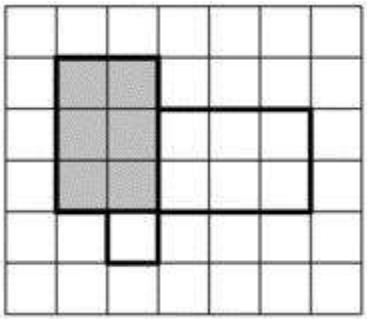
c.



d.



Solution:

a.  

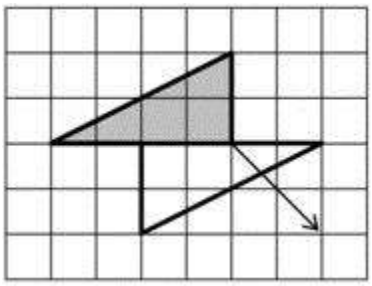
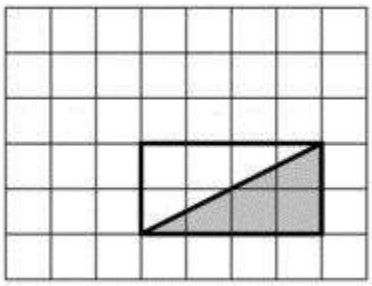
On the left we can see that the figure is composed of a rectangle with area of $2 \cdot 5 = 10$ square units plus another with area 2 and a third with area 1 square unit. So the total area is

$$10+2+1=13 \text{ square units.}$$

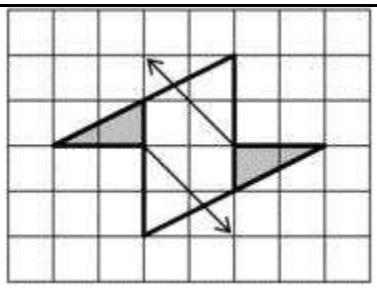
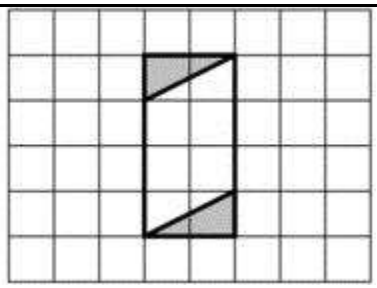
On the right we can see that the area is composed of two rectangles and a single square:

$$2(2 \cdot 3) + 1 = 13.$$

In either case, we see the area is 13 square units.

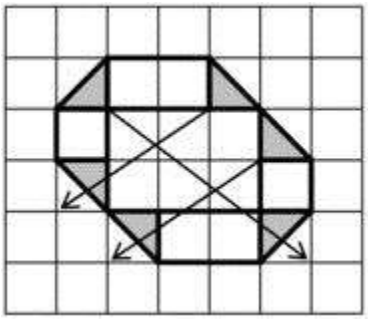
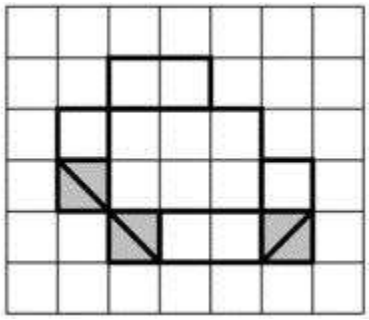
b.  

In the figure above, we see that we can subdivide the figure into two right triangles that can be recombined into a rectangle with length 4 units and width 2 units. So the area is $4 \cdot 2 = 8$ square units.

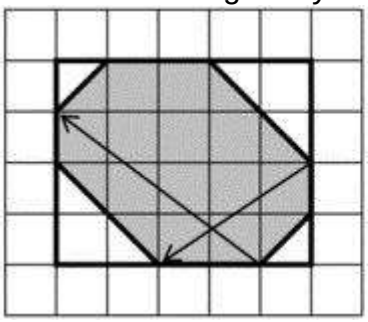
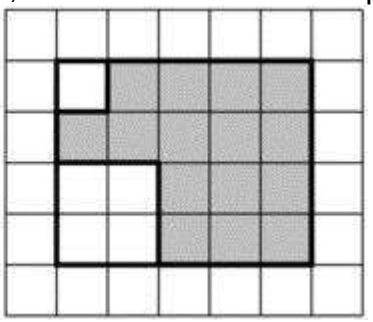



Another way to look at this figure is to cut off the small triangles that "stick out" on the sides and place them so they complete a rectangle that has a length of 2 units and a width of 4 units. So the area of the figure is equivalent to a rectangle with area $2 \cdot 4 = 8$ square units.

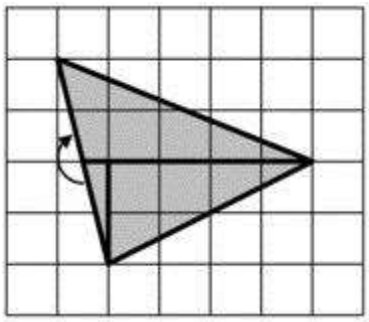
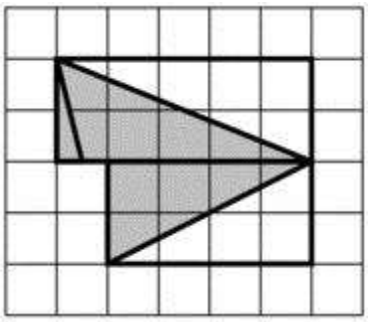
c.

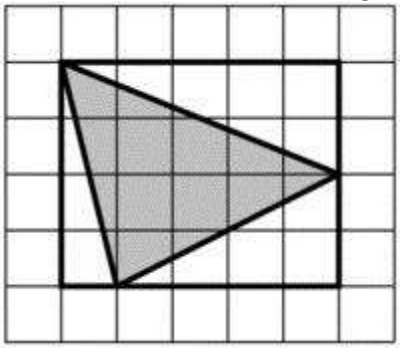
This figure shows that if we are persistent, we can decompose this figure into a bunch of triangles with area 12 square unit along with some rectangles. Moving them around and adding everything up, we see the area is 15 square units.

We can find the area in fewer steps if we "enclose" the figure with a rectangle. Now we can see that we can recombine the "white space" into a square with area 1 square unit and another with area 4 square units. The entire rectangle has area $4 \cdot 5$ square units, so the area of the original figure is $20 - 4 - 1 = 15$ square units.

d.  

There is a clever way to do it by moving pieces around that shows the area of the figure is the sum of the area of two right triangles, one of which has an area that is half a 2 by 5 rectangle and the other of which is a 2 by 4 rectangle. All told, this means the area of the original triangle is $5+4=9$ square units.



This is the figure where it is most helpful to understand that since the area of non-overlapping regions is additive, it can also be subtracted. If the triangle is "enclosed" by a rectangle with area $4 \cdot 5=20$ square units, we can subtract the area of three right triangles, each with area 2, 4, and 5. So the area of the original triangle is $20-2-4-5=9$ square units, as we found before.

Unit 4 Performance Task 2 PLD Rubric

SOLUTION

- Student indicates that the area is 13 square units for the first figure and explains there answer
- Student indicates that the area is 8 square units for the second figure and explains there answer
- Student indicates that the area is 15 square units for the third figure and explains there answer
- Student indicates that the area is 9 square units for the fourth figure and explains there answer

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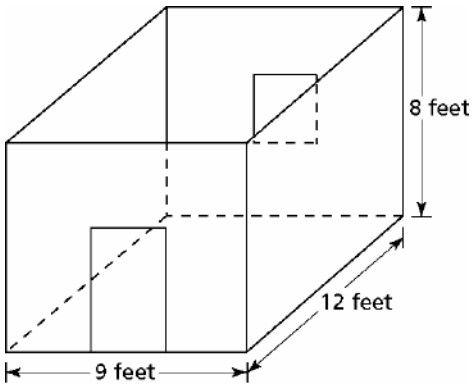
How much is needed for redecoration? (6.G.A.4)

Jason is planning to redecorate his bedroom. He measured the room and made this rough sketch.



He is planning to buy paint for the walls and ceiling.

a. Jason is planning to buy carpet for his floor. Does he need to find area or perimeter? Explain your reasoning. How much carpet will Jason need? Include the units.

b. He is planning to buy baseboard for around the bottom of the walls. Does he need to find area or perimeter? Explain your reasoning. How much baseboard will Jason need? Include the units.

c. He is also planning to paint the walls and ceiling. Does he need to find the area or perimeter? Explain your reason. If a gallon of paint covers 350 square feet, how much paint does Jason need for the walls and ceiling? Show your work.

Solution

a. Jason will need to find the area in square feet/yard, because he needs to find out how much carpet is needed to cover the space on the floor. The room is 3 yards (9 feet) by 4 yards (12 feet), so $3 \times 4 = 12$ square yards of carpet are needed (108 square feet is also correct).

b. He will need to find the perimeter in feet, because the baseboard is needed for around the wall and perimeter will measure the distance around the wall. He will need $(9 + 12) \times 2 = 42$ feet of baseboard (Some students may argue for less than 42 feet-say, 39 feet-because of the door opening not needing baseboard. This is a reasonable answer as well.)

c. Jason will need to find surface area of the walls and ceiling to find out how much space should be covered in paint. Two of the walls need $12 \times 8 = 96$ square feet of paint, two of the walls need $9 \times 8 = 72$ square feet of paint, and the ceiling needs $12 \times 9 = 108$ square feet of paint, so there is $(96 \times 2) + (72 \times 2) + 108 = 444$ square feet to cover.

This would require $444 \div 350$ = about 1.27 gallons of paint, so you would need $1\frac{1}{2}$ or 2 gallons (if the paint came only in full gallons).

Unit 4 Performance Task 3 PLD Rubric

SOLUTION

- Student indicates area in units and explains the reason. Student mentions that 108 square feet of carpet is needed
- Student indicates perimeter in units and explains the reason. Student mentions that 42 feet of baseboard is needed to surround wall on floor.
- Student indicates all the areas (walls and ceiling) and explains the reason. Student indicates the space that needs to be covered with paint (444 square feet) and about 1.27 gallons (1 and ½ or 2 gallons) of paints needed

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